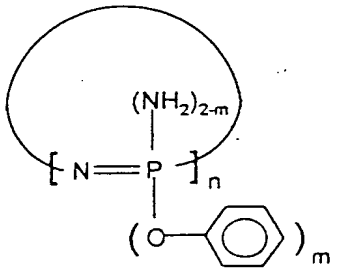
CLAIMS

What is claimed is:

1. A flame retarded epoxy resin composition, which comprises:

(A) at least one type of epoxy resin; and

(B) a phosphorus-and-nitrogen-containing heterocyclic compound, said compound having a moiety which can react with the epoxy group of the epoxy resin, useful as a hardening agent for the epoxy resin, and having a structure as shown by formula (I):



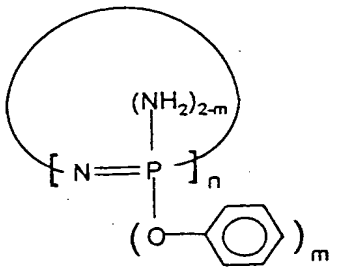
(I)

wherein m is an integer of from 0 to 2, n is an integer of from 3 to 7, but at least one m is not 2.

2. A flame retarded epoxy resin composition, which comprises:

(A) at least one type of epoxy resin;

(B) a phosphorus-and-nitrogen-containing heterocyclic compound, said compound having a moiety which can react with the epoxy group of epoxy resin, useful as a hardening agent for the epoxy resin, and having a structure as shown by formula (I):



(I)

wherein m is an integer of from 0 to 2, n is an integer of from 3 to 7, but at least one m is not 2; and

(C) a hardening agent, which does not contain phosphorus;

and selectively added:

(D) a hardening promoter;

(E) a solvent; and, additionally,

(F) additives.

3. The flame retarded epoxy resin composition according to claim 1 and 2, wherein the epoxy equivalent weight (EEW) of (A) epoxy resin is 600 or less.

4. The flame retarded epoxy resin composition according to claim 1 and 2, wherein the types of (A) epoxy resin comprise : the epoxy group containing compounds modified with the moiety such as bisphenol, phenol, dihydroxybenzene, bis(biphenol), naphthalene, alkyl, alkenyl hydrocarbon, cyclic hydrocarbon, nitrogen-containing hetero ring, cresol-aldehyde, siloxane or polysiloxane, and aryl phosphate.

5. The flame retarded epoxy resin composition according to claim 4, wherein the epoxy group containing compounds comprise glycidyl ethers, glycidic amines, glycidyl thiol ethers, and glycidyl carbonates.

6. The flame retarded epoxy resin composition according to claim 1 and 2, wherein the (A) epoxy resin component is a glycidyl ether modified with bisphenol, bis(biphenol), dihydroxybenzene, polyols, and silicones.

7. The flame retarded epoxy resin composition according to claim 6, wherein said modified glycidyl ether comprises: bisphenol modified diglycidyl ether having –Ph-X-Ph-, wherein X is CH_2, $C(CH_3)_2$, $CH(CH_3)$, O, S, C=O, or SO_2; bis(biphenol) modified glycidyl ether is 4,4'-diphenol glycidyl ether, 3,3'-dimethyl-4,4'-diphenol glycidyl ether, or 3,3',5,5'-tetramethyl-4,4'-diphenol glycidyl ether; dihydroxybenzene glycidyl ether is resorcinol glycidyl ether, p-dihydroxybenzene glycidyl ether, or isobutyldihydroxybenzene glycidyl ether; phenolic polyglycidyl ether is phenol-aldehyde polyglycidyl ether, cresol-aldehyde polyglycidyl ether, or bisphenol A-phenolic polyglycidyl ether; polyhydroxyl phenyl phenol polyglycidyl ether is tri(4-hydroxyl phenyl)methane polyglycidyl ether, tri(4-hydroxyl phenyl)ethane polyglycidyl ether, tri(4-hydroxyl

phenyl)propane polyglycidyl ether, tri(4-hydroxyl phenyl)butane polyglycidyl ether, tri(3-methyl-4-hydroxyl phenyl)methane polyglycidyl ether, tri(3,5-dimethyl-4-hydroxyl phenyl)methane polyglycidyl ether, tetra(4-hydroxyl phenyl)ethane polyglycidyl ether, tetra(3,5-dimethyl-4-hydroxyl phenyl)ethane polyglycidyl ether; or a mixture thereof.

8. The flame retarded epoxy resin composition according to claim 7, wherein (A) epoxy resin is bisphenol A polyglycidyl ether, resorcinol glycidyl ether, tri(4-hydroxyl phenyl)methane polyglycidyl ether, tetra(4-hydroxyl phenyl)ethane polyglycidyl ether, cresol phenolic polyglycidyl ether, or a mixture thereof.

9. The flame retarded epoxy resin composition according to claim 1 or 2, wherein (A) epoxy resin is modified with silicones or rubber copolymers.

10. The flame retarded epoxy resin composition according to claim 9, wherein silicone compounds are siloxanes with amino ending groups, and rubber copolymers are copolymers of butadiene and acrylonitrile with carboxy or amino ending groups.

11. The flame retarded epoxy resin composition according to claim 1 or 2, wherein the contents of (A) epoxy resins and (B) phosphorus-and-nitrogen-containing heterocyclic compounds are such that, according to the reactive hydrogen equivalent weight and epoxy equivalent weight of epoxy resin, the reactive hydrogen equivalent weight of hardening agents is from 20% to 95%, related to the epoxy equivalent weight of 100%.

12. The flame retarded epoxy resin composition according to claim 2, wherein (C) a hardening agent, which does not contain phosphorus, is dicyandiamide, diaminodiphenylmethane, diethyltriamine, diaminodibenzenesulfone, m-phenyldiamine, methyl diphenylamine, maleic acid, phthalic acid, hexahydrophthalic acid, or tetrahydrophthalic acid.

13. The flame retarded epoxy resin composition according to claim 2, wherein (C) a hardening agent, which does not contain phosphorus, is a tertiary amine, quaternary

ammonium salt, tertiary phosphine, quaternary phosphonium salt, or imidazole compound.

14. The flame retarded epoxy resin composition according to claim 2, wherein the content of (C) a hardening agent, which does not contain phosphorus, is such that, according to reactive hydrogen equivalent weight and epoxy equivalent weight of epoxy resin, the reactive hydrogen equivalent weight is from 20% to 95%, related to the epoxy equivalent weight of 100%.

15. The flame retarded epoxy resin composition according to claim 2, wherein the content of (D) a hardening promoter is from 0.005% to 5.0 % by weight based on the total weight of the composition.

16. The flame retarded epoxy resin composition according to claim 1or 2, wherein thermal stabilizers, light stabilizers, ultraviolet absorbers, plasticizers, or inorganic fillers can be additionally added to the resin composition.

17. The flame retarded epoxy resin composition according to claim 1 or 2, wherein said resin composition and reinforced substrate are made into prepregs.

18. The flame retarded epoxy resin composition according to claim 17, wherein said prepreg can be laminated to form a laminate or laminated plate having flame retardancy and high heat resistance.

19. The flame retarded epoxy resin composition according to claim 1 or 2, wherein said composition can be coated on a substrate to form a dielectric material for build-up process.

20. The flame retarded epoxy resin composition according to claim 1 or 2, wherein the prepreg made of said composition can be hot pressed with copper foil to form laminated material for use in a printed circuit board manufacturing process.

21. The flame retarded epoxy resin composition according to claim 19, wherein the substrate used for making dielectric materials for build-up preocess is copper foil or releasing film.

22. A flame retarded epoxy resin hardening composition, which is characterized that said hardening composition is made by hardening the flame retarded epoxy resin composition according to claim 1 or 2.